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RADIUM

EDITED BY
CHARLES H. VIOL, Ph. D.
AND
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VOL. XVII MAY, 1921 No. 2

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A MONTHLY JOURNAL DEVOTED TO THE CHEMISTRY PHYSICS AND THERAPEUTICS OF RADIUM AND RADIO-ACTIVE SUBSTANCES

RADIUM

A MONTHLY JOURNAL DEVOTED TO THE CHEMISTRY, PHYSICS AND THERAPEUTICS OF RADIUM AND RADIO-ACTIVE SUBSTANCES

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Edited by Charles H. Viol, Ph. D., and William H. Cameron, M. D with the assistance of collaborators working in the fields of Radiochemistry, Radioactivity and Radiumtherapy.

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VOL. XVII MAY, 1921 No. 2

NEW CONCEPTIONS RELATIVE TO THE TREATMENT OF MALIGNANT DISEASE WITH SPECIAL REFERENCE TO RADIUM IN NEEDLES*

Twenty-four Illustrations†

WILLIAM L. CLARK, M.D., PHILADELPHIA

Those of us who are engaged in studying and treating malignant disease realize that much is yet to be learned before the problems of malignancy are entirely solved; yet realizing our definite limitations, we know that much more can be accomplished by combined methods of attack than could be accomplished in the past when operative surgery alone was relied upon. When the etiology of cancer is finally determined, perhaps some specific, analogous to anti-toxin in diptheria or quinine in malaria, may be found, but from present knowledge local attack is most fruitful of positive results. Operative surgery, electrothermic methods (desiccation, coagulation, cautery), radium and x-rays, alone or in combinations, are the most important methods to be considered, and they have been found to be of the greatest practical value in combating malignant disease in its various manifestations. Since it is almost impossible

*Reprinted by permission from the Penna. Med. Jour. XXIV, 214-224, Jan. 1921. Read before the General Meeting of the Medical Society of the State of Pennsylvania, Pittsburgh Session, October 5, 1920.

†It is the impression of the author that visualization of results favorable and unfavorable will give a clearer idea of the merits of the respective methods under consideration than the citation of full case histories, which would require more space than is available; hence it is hoped that brief legends accompanying the photographs will in a measure serve the purpose intended.

for one man to be proficient in all these methods, co-operation among a group of men, each expert in his own specialty, is desirable. To accomplish, however, the maximum of success, with these available weapons, it is necessary to revise some fallacious ideas which are still considered orthodox by many, perhaps by a majority of the medical profession. The use of combined methods in the treatment of cancer has been shown from clinical experience to be sound practice. The physician who employs only one to the exclusion of all others, while he may have limited success with certain types of cancer, can not obtain so brilliant results in a wide range of cases as he who uses various methods judiciously combined.

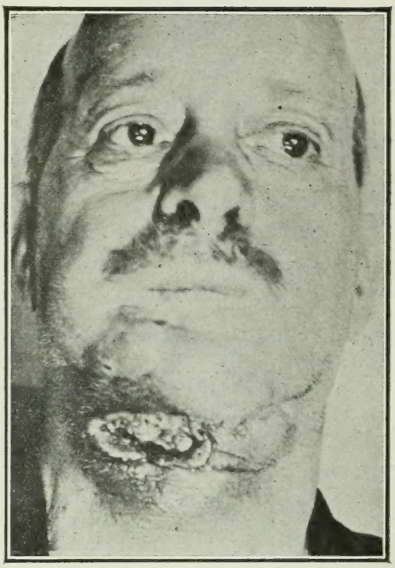
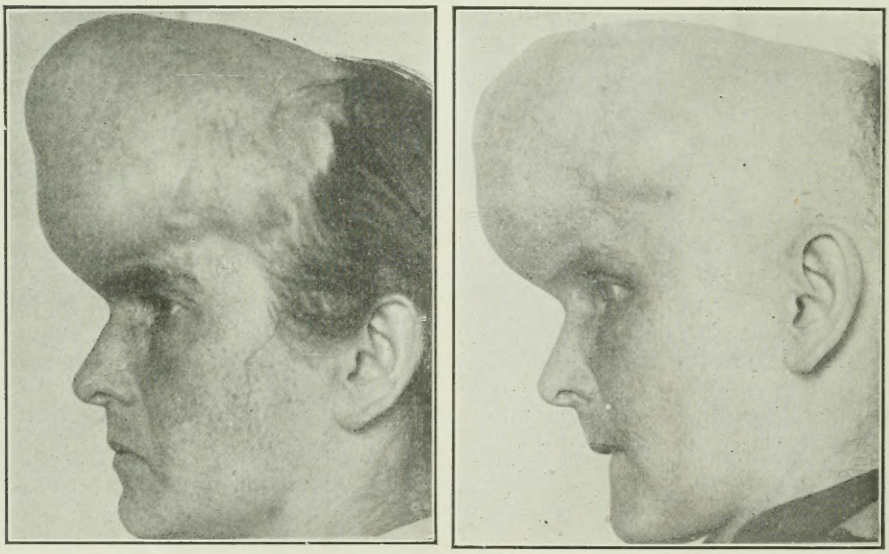


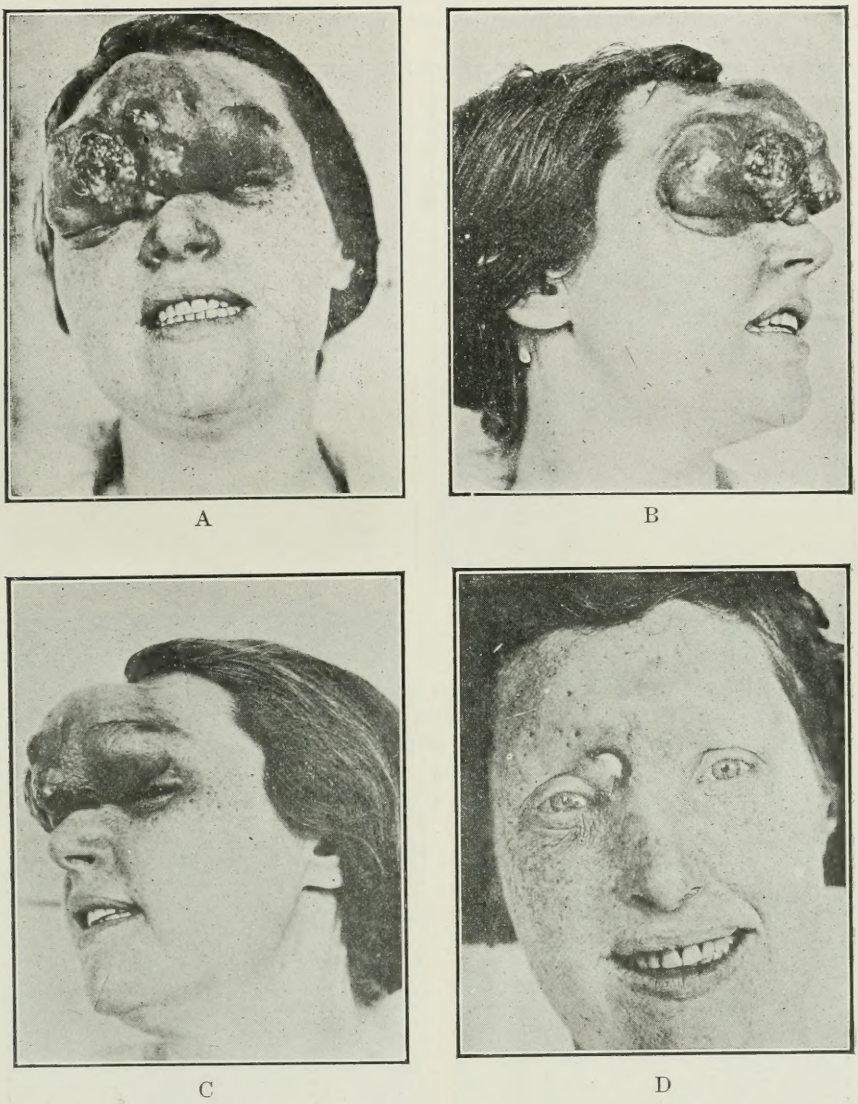
Fig. 1. — Exemplifying recurrence after surgical excision of an epithelioma of the lower lip and dissection of metastatic cervical glands without preliminary preparation with radium or x-rays. The migratory cells in the lymphatic ducts drained into the tissues of the neck and diffuse recurrence soon took place.

The problem of basal cell epitheliomata or rodent ulcers involving cutaneous surfaces, especially about the face, eyelids, etc., growths which seldom metastasize even though advanced, has been solved. Total eradication of the lesion by any method will result in clinical cure. Epithelio-



A B

Fig. 2.—A, mixed angio- and osteosarcoma. Referred by Dr. J. W. Croft, Waynesboro, Pennsylvania. B, note retrogression after first radium needle treatment. Two later radium treatments from the outside resulted in still further reduction in the size of the lesion. An absolute cure is not expected in this case because of very deep involvement, but the patient's life has undoubtedly been prolonged.



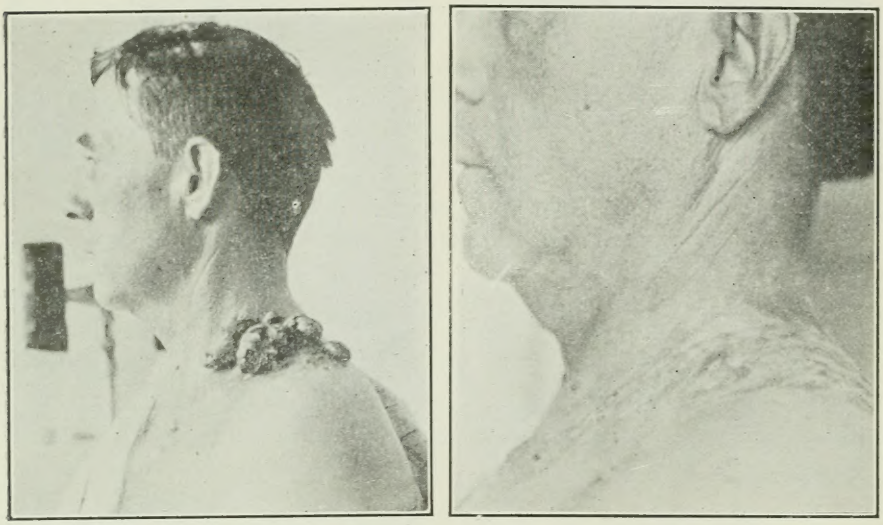
A B C D

Fig. 3.—A, B, C, small round cell sarcoma, shown from different angles, involving frontal region, bone, frontal sinus, eyelids and nose. Recurrence after surgical operation, when growth in the sinus was curetted through opening in frontal bone. Case referred by Drs. Homer I. Silvers and W. Price Davis, Atlantic City, N. J. D, result of radium needle treatment. Note total retrogression without destruction of tissue, and conservation of eyelids. No recurrence in two years.

mata involving the skin of the extremities are treated less successfully because of the greater tendency of such growths to metastasis. The method, or methods, to use in these cases is a matter of personal preference. An operator who is a master of his own method will succeed where others using the same method will fail because of imperfect technic.

The squamous cell and glandular types of cancer are the most difficult of management, because they usually progress rapidly, metastasize early, and because the migratory cells in the ducts cannot be reached by

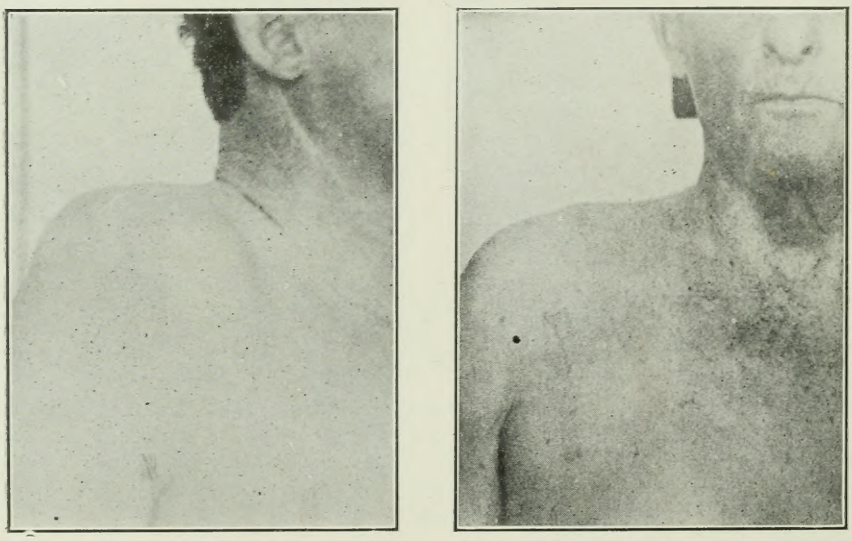
surgical treatment. Malignant disease of the lip, buccal surface, tongue, floor of the mouth, alveolus, antrum, tonsils, soft palate, pharynx, epi-



A B

Fig. 4.—A, mixed cell sarcoma, recurrence after two surgical operations. B, result of combined desiccation and radium needle treatment. No recurrence in 7 months.

glottis, larynx, esophagus, stomach, breast, uterus, rectum, etc., taxes the skill of the surgeon; but frequently brilliant results are obtained even in these cases by the use of combined methods, results that were impossible of accomplishment in the past before the newer methods were availabl. This is true also of the various types of sarcoma.

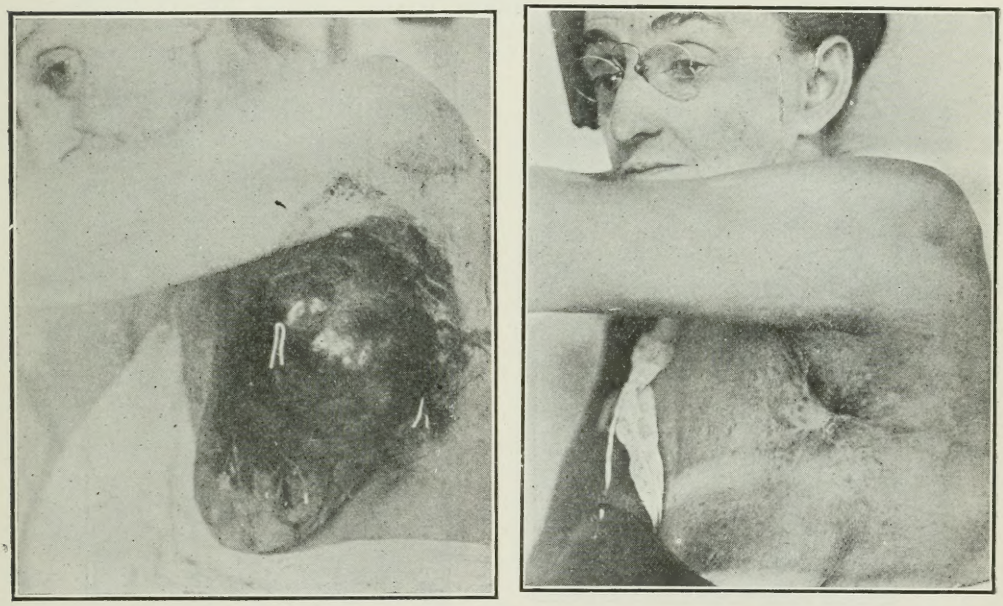


A B

Fig. 5.—A, extensive sarcoma involving the deltoid and shoulder, attached to the bone, extending to the subclavian and axiliary regions. Referred by Dr. John Chalmers Da Costa, Philadelphia. B, result of one radium needle treatment. There was total retrogression of the disease in this case with no recurrence in ten months.

Excision or other treatment of primary malignant lesions of the types which metastasize, together with block dissection of apparently uninvolved glands, for prophylaxis, or of palpable metastatic glands for the purpose of total eradication of the disease, no matter how thoroughly executed, is certainly not sufficient. The migratory cells in the lymphatic ducts must also be taken into consideration and rendered innocuous by appropriate measures to be discussed later, else they will drain into the tissues after the glands, nature's safeguards, have been removed, and early recurrence and rapid progress of the disease will usually result. Operative surgery, without preliminary preparation,, is unsafe in these cases, and the patient, if denied the benefits of preliminary treatment, will usually live longer and in greater comfort if the disease is left to run its course without interference. That migratory, malignant cells do exist is not a mere hypothesis, but a reality recognized by pathologists, and measures must be adopted to destroy the microscopic cells in situ before attempting surgical or any other treatment of the perfectly apparent lesions.

The lethal action of radium, and in a lesser degree of the x-rays, upan malignant cells of all types—some types resisting more than others—has been proved both in the laboratory and in practice. The following quotation from a paper by Sonnenschein, "The Use and Possible

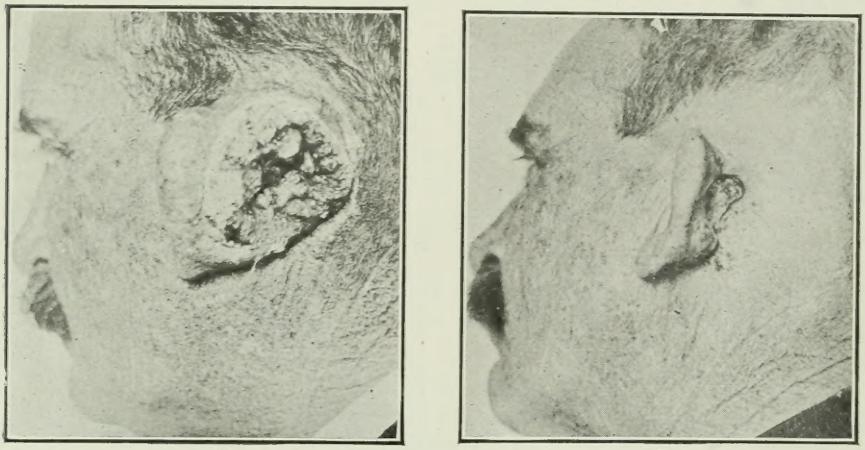


A B

Fig. 6.—An inoperable adenocarcinoma of the breast and axilla. Referred by Dr. Wm. Benham Snow, New York City, and Dr. F. A. Jewett, Brooklyn. Diagnosis made by Professor John Chalmers Da Costa, Philadelphia. B, result of radium needle and x-ray treatment. There was total retrogression of the disease in six weeks. When treatment was begun the patient was toxic, cachetic and anaemic, had lost much weight, and death seemed imminent. After treatment she regained normal weight, and has been free from apparent disease for eight months.

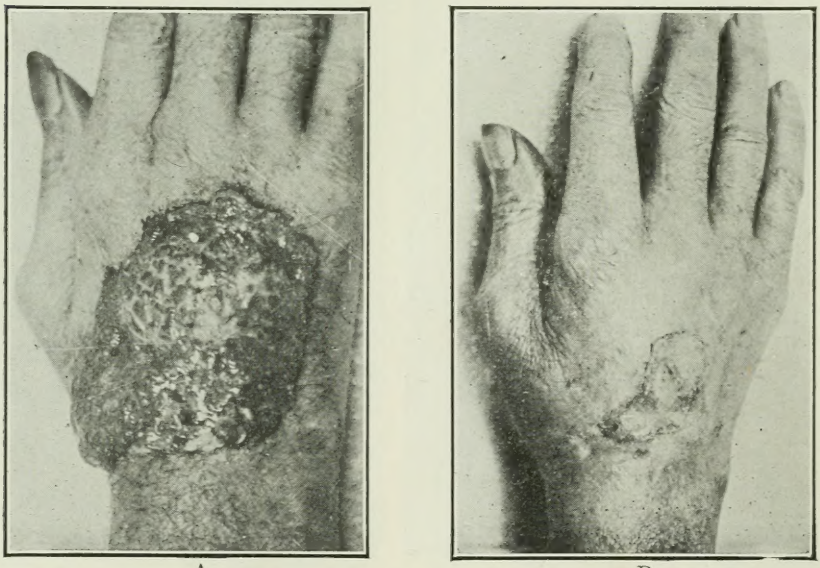
Abuse of Radium in the Treatment of Malignant Tumors of the Nose and Throat," published in the Journal of the American Medical Asso-

ciation, September 25, 1920, embodies present knowledge regarding the action of radium upon malignant cells from the laboratory standpoint: "Wood and Prime showed that exposure to beta and gamma rays for a



A B

Fig. 7.—A, basal cell epithelioma involving the ear and mastoid region. Referred by Dr. F. C. Tice, Roanoke, Va. B, retrogression of growth after radium needle treatment, with conservation of ear. Patient in good condition after 15 months.

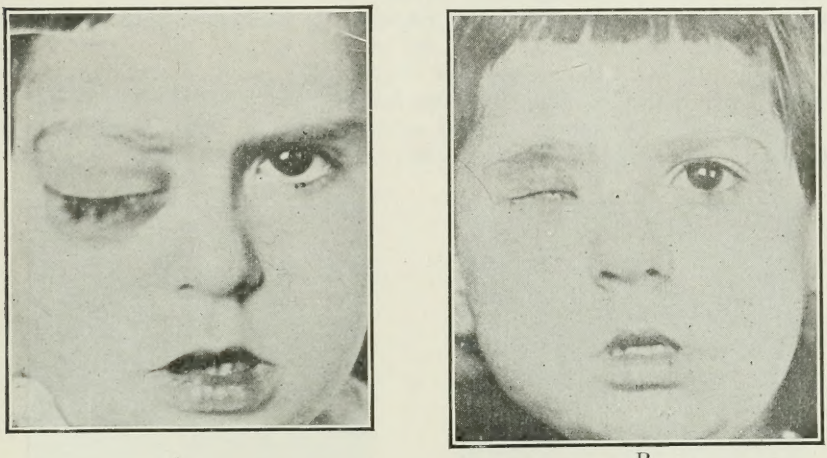


A B

Fig. 8.—A, basal cell epithelioma of the dorsal surface of hand involving tendons and bloodvessels and adherent to bone. Patient aged 76. Referred by Dr. H. B. Baxter, Philadelphia. B, retrogression without great impairment of motion of the hand after radium needle treatment. This did not heal completely and finally amputation was done to guard against metastasis upon the advice of the attending surgeon.

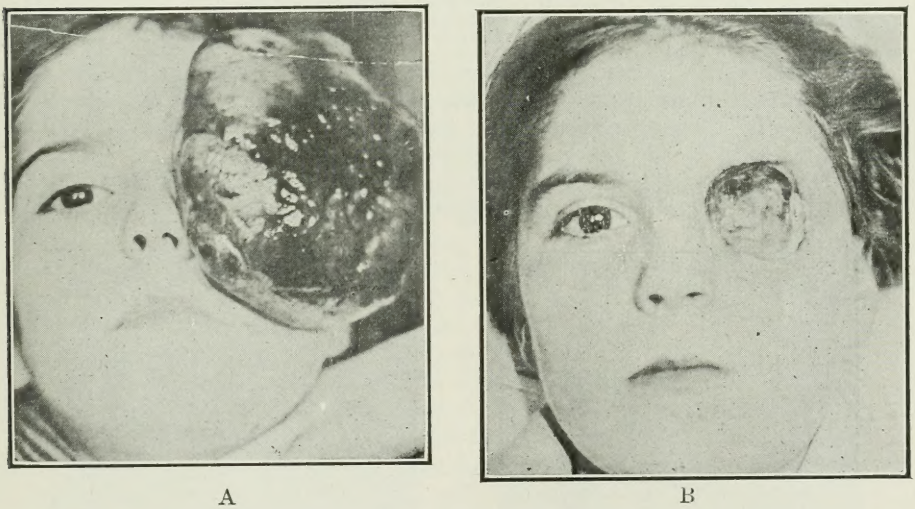
time just too short to kill the tumor cells caused a marked slowing in the growth of the cells. They cannot explain the variability in lethal action of the rays except to say 'that it is exhibited only in groups of young cells undergoing, or which have recently undergone mitosis, and that older cells escape to grow in the tissues of the host and produce

tumors.' They found that 80 to 100 mg. of radium element would kill cancer cells in seven hours. To get lethal action in the depths of the



A B

Fig. 9.—A, glioma of the retina, recurrence after enucleation. Referred by Dr. Paul Pontius, Philadelphia. Pathological examination by Dr. Nelson M. Brinkerhoff, Philadelphia. B, entire retrogression and disappearance after radium needle treatment. Free from recurrence six months, when the other eye became involved with disease. An opportunity to give further treatment was denied and patient died from extension of the disease.

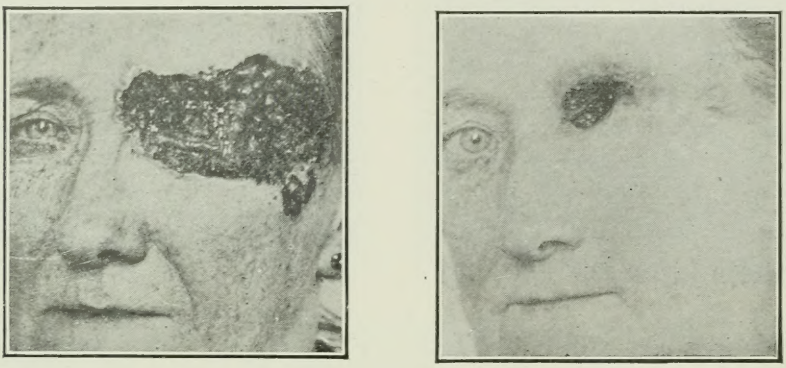


A B

Fig. 10.—A, glioma of the retina in child 9 years old. Referred by Dr. G. Oram Ring, Philadelphia. Pathological examination by Dr. C. Y. White, Philadelphia. Recurrence after enucleation of eye. This glioma grew so rapidly that in five weeks it measured twenty inches in circumference. B, result two months after electrocoagulation operation. The condition later healed very much more. Child died nine months later during the late epidemic of infantile paralysis. Whether death was caused by spinal metastasis or infantile paralysis has been impossible to determine since autopsy was refused. There was no local recurrence.

tissue the gamma rays are essential. That immature cells or those in a state of subdivision are more sensitive to radiation than those which have already acquired adult morphological and physiological characters

is the law propounded by Bergonie and Tribondeau, and quoted by Knox. Radium acts on normal tissues by stimulating in small doses, with larger amounts producing early congestion and later fibrosis. If the exposures are prolonged and the filtration is insufficient, the action of the rays may become caustic, or the process may go on to necrosis or sloughing. With proper exposure there will be inflammatory reaction, which slowly subsides, fibrous tissue forms, cutting off the blood supply, with necrosis if the action is rapid, or atrophy if it is slower. Radiation effects depend on quantity of radium, filtration, distance of application

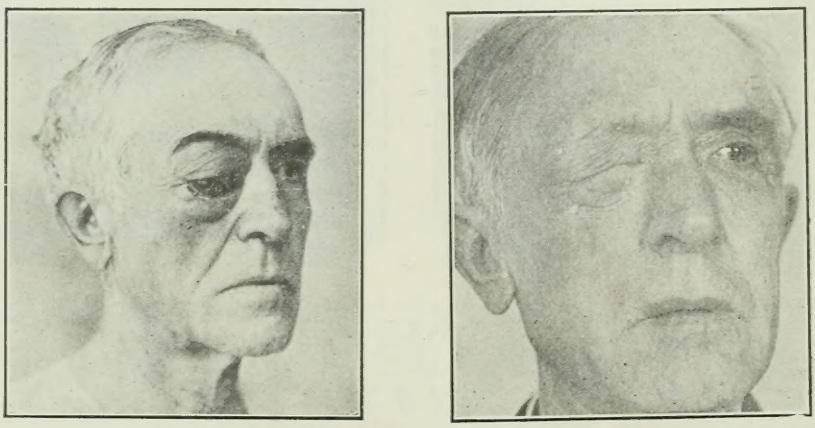


A B

Fig. 11.—A, basal cell epithelioma in which the eyeball and the bones of the orbit were involved. Referred by Dr. E. Kapeghian, Philadelphia. B, result of one electrocoagulation treatment. Complete exenteration of the orbit was accomplished without hemorrhage immediately afterwards. No recurrence in three years. Note slight contracture and regeneration of tissue.

and length of exposure. Ionization of the nuclei, alteration in type of the cells to a more benign form, the production of antibodies, etc., are some of the theories advanced by Ewing, Lazarus-Barlow, Wood and others to explain the action of radium on the tissue cells."

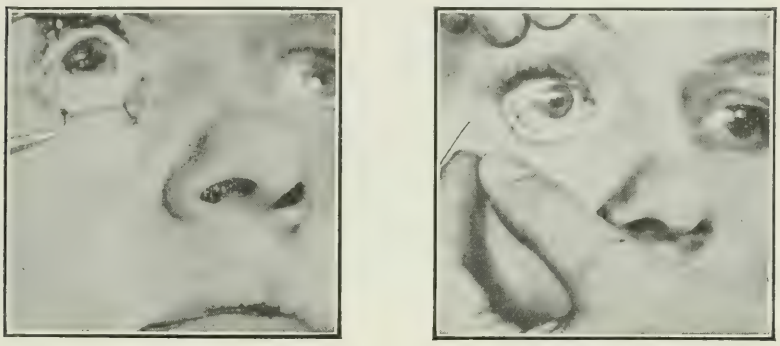
It is recommended, after observing the good results in practice, that at least one maximum radium treatment with proper technic be given



A B

Fig. 12.—A, sarcoma involving the globe and orbit. Referred by Dr. Don M. Campbell, Detroit, Michigan. B, result of enucleation and radium needle treatment. Note ,in addition to the retrogression of the growth, the gain in weight and improved appearance of the patient. No recurrence in seven months.

preparatory to any other procedure, especially before a surgical operation, for the purpose of first inhibiting and finally rendering benign the migratory cells in the ducts, and producing glandular fibrosis. It has



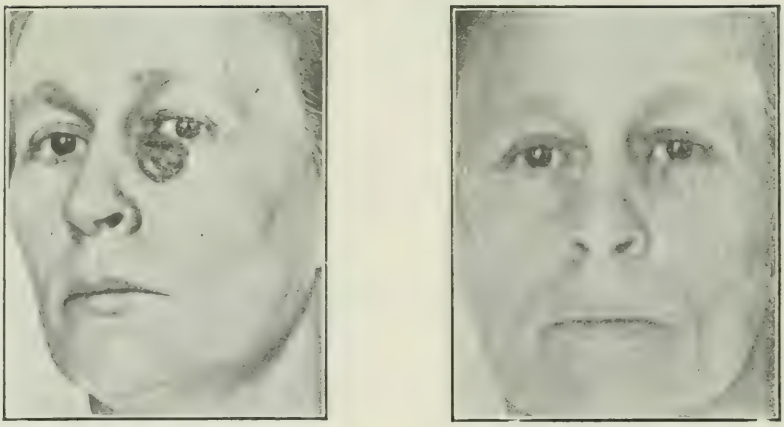
A B

Fig. 13.—A, sarcoma involving the sclera and cornea. Referred by Dr. Burton Chance, Philadelphia. Pathological examination by Dr. Nelson M. Brinkerhoff, Philadelphia. Excision was practiced twice with recurrence each time. B, result of one desiccation treatment under local anesthesia. Free from recurrence four years.

been the author's custom to allow a week or more to elapse between the radium treatment and whatever operative work is undertaken; but, if it does not seem prudent to temporize with a rapidly growing lesion this may be modified. At least three cross-fire radium treatments, averaging six weeks apart should also follow any operative or other procedure for further inhibitory and lethal action upon any malignant cells that may still remain. The x-rays, though less potent, may sometimes be used to supplement this treatment, cross-firing through other skin areas, thus adding to the potency of radium.* Hard x-rays from a Coolidge or other suitable tube may be used advantageously to reach deep structures, if a large quantity of radium is not available. Most physicists and most radiumologists believe that there is little choice between the activity of radium element and the emanation, milligram for millicurie. The emanation, however, decays and loses its potency from day to day unless renewed, while the element is permanent in its activity. The folly of depending upon any one method alone in cancer with metastasis and the wisdom of pre- and post-operative treatment have been amply demonstrated by various workers in this field throughout the country.

If the invaded glands have not broken down, they will usually disappear under judicious cross-fire radium treatment. If the glands are small, treatment may be given externally; if large, radium needles should be inserted directly into the glands. It is often difficult and may be impossible accurately to determine whether the glands are simply inflammatory or whether true metastasis has taken place; but the indi-

*Important experimental work is under way in European and American laboratories to improve the efficiency of the x-rays by increasing the current frequency and shortening the wave lengths, thus making possible homogenous penetrating rays, so that the action of these improved x-rays may approximate the action of the gamma rays of radium. Very powerful x-ray machines with tubes to back up an eighteen to twenty inch spark gap have been constructed. From preliminary reports it would appear that this object may in time be accomplished.



A B

Fig. 14.—A, epithelioma involving the lower eyelid and inner canthus. Referred by Dr. P. M. K. Schwenk, Philadelphia. B, result of one desiccation treatment. Note good cosmetic result with no contracted cicatrix.

A B

Fig. 15.—A, basal cell epithelioma adherent to the bone, of 20 years duration. Referred by Dr. Wm. P. Hearn, Philadelphia. B, result of one electrocoagulation treatment. Patient died one year later of pneumonia but without recurrence of the epithelioma.

cation for radium is the same in either case, for no chances should be taken. If degenerated in the parenchyma, the glands will reduce in size, but not entirely disappear, and radium treatment will convert the gland capsule into benign fibrous tissue. This has been frequently demonstrated by laboratory study and by gross examination. Then the gland may be incised, curetted, or drained with comparative safety to the patient, after which a tube of radium properly screened, or radium needles, may be inserted through the capsule of the gland into the adjacent tissues as an additional safeguard.

The adaptation of hollow, metallic needles, each containing some radium salt—preferably the sulphate—representing a known quantity of

A

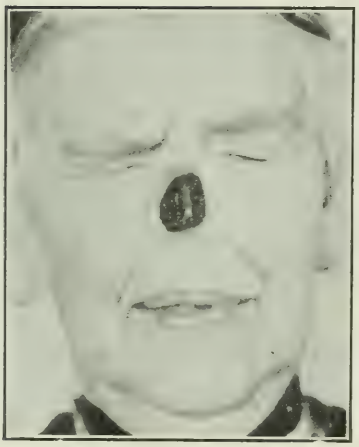
B

C

Fig. 16.—A, rodent ulcer of 15 years duration advancing rapidly at the time of consultation. Referred by Dr. J. D. Morgan, Montreal, Canada. B, result of one electrocoagulation operation. Patient free from disease two years. C, artificial nose, lip and mustache by the sculpture method.

radium element, has revolutionized radium technic. (The author uses needles containing 5 to 10 milligrams). These needles are used for insertion into malignant growths and glands, or into an organ contained in the peritoneal cavity after exposure of the lesion by laparotomy—the pylorus for example. Results are obtained by this method of radium application that cannot be secured by the application of radium in capsule or plaque. This method of application is more accurate and a comparatively small quantity of radium applied in needles will produce even more favorable results than a large quantity applied from the outside or inserted in capsule form into the malignant tissue through an incision. Under the latter condition the action is too concentrated at the point of contact and the advantage of cross-firing is not obtained. The capsule and plaque, however, have their special and even indispensable uses when radium must be applied from the outside or in a cavity. The needles are particularly efficacious in the treatment of growths too large for radium penetration from the outside by capsule or plaque, and in the

A



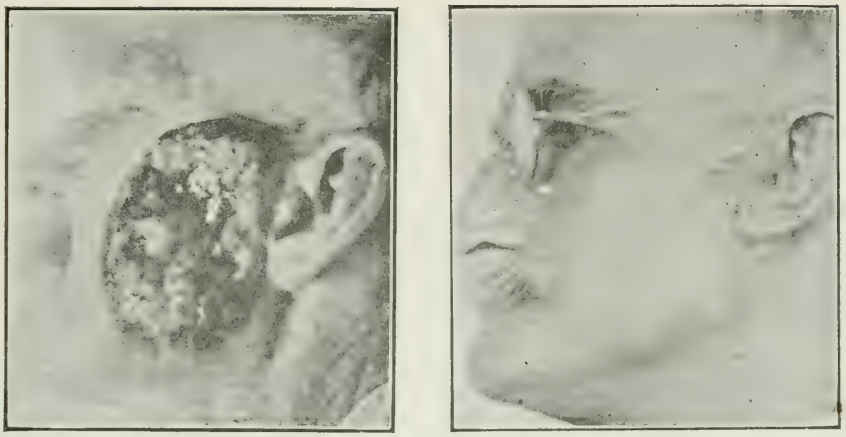
B

C

Fig. 17.—A, basal cell epithelioma of the nose. Referred by Dr. Alfred Hand, Philadelphia. B, result of one electrocoagulation treatment. C, artificial nose by the sculpture method

more resistant forms which hafe been found unresponsive to radium from the outside. As many needles as necessary may be inserted 20 to 25 millimeters apart, to any depth into the tissues, thus taking advantage of concentric cross-fire radiation from needle to needle. If a sufficient number of needles are available, they may be grouped together and put into a capsule of brass or other metallic filter and covered with rubber. These may be used in the same manner as the ordinary radium capsule, or the needles may be placed side by side in a suitable flat metallic container covered with rubber and used whenever a flat plaque of standard construction is indicated for the treatment of malignant disease. When radium in needles is inserted into the tissues the entire quantity of radium is utilized in the tissues, whereas, when radium is applied from the outside in capsule or plaque, more than one half of the radio activity is dissipated in the air.

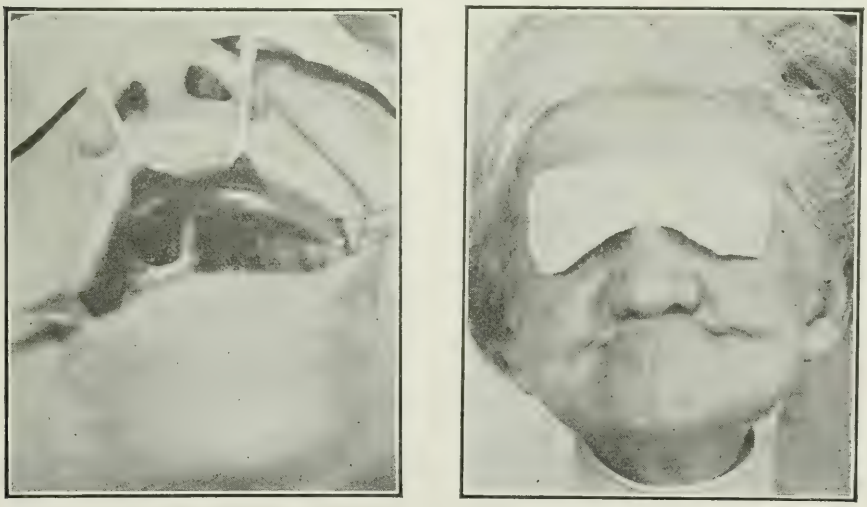
While the treatment of malignant lesions in easily accessible anatomical locations is considered to be more successful than in locations



A B

Fig. 18.—A, advanced basal cell epithelioma involving the cheek, parotid gland and osseous structures. Referred by Dr. Wm. Hamil of Philadelphia. This case had resisted many forms of treatment and at the time of consultation the patient was very toxic, emaciated, and in such a low state of vitality that death was imminent. B, result of one electrocoagulation operation under ether anesthesia, which was entirely bloodless. Note regeneration of tissue and slight scarring. No recurrence in three years. Patient gained over 50 pounds and is in perfect health.

difficult of access, recent experience with radium needles has demonstrated that malignant disease of the pylorus, intestines, omentum, indeed of any abdominal viscera, larynx, antrum, sphenomaxillary fossa, frontal sinus, orbit, œsophagus, prostate gland, bladder, rectum and uterus (even though the broad ligaments and other pelvic structures are involved) may not be entirely hopeless. For example, two cases of very advanced cancer of the pylorus with almost complete stenosis, shown by serial radiographic studies and later verified by gross examination at the time of operation, were attempted by radium needle treatment.



A B

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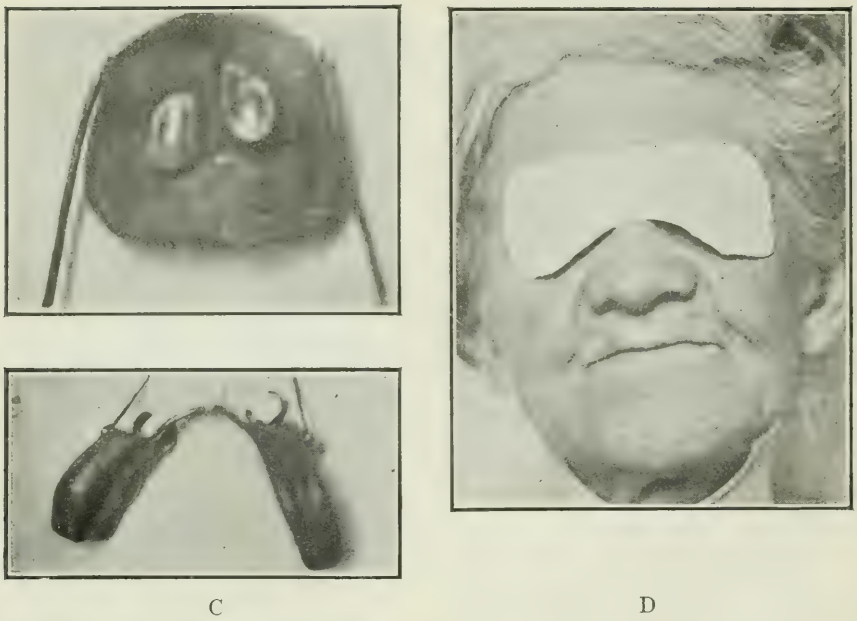

C D

Fig. 19.—A, result of electrocoagulation operation for extensive carcinoma involving the upper alveolus and inner surface of the lip, also the antrum on both sides. Case referred by Dr. John B. Deaver, Philadelphia. B, deformity without dental plates. C, dental plates showing posterior views made by R. Douglas Scott, D.D.S., Philadelphia. D, appearance of patient with plates in place. She is able to articulate distinctly and deformity is corrected. No recurrence in three years.

A preliminary gastroenterostomy was performed in both cases by Dr. Frank White of Philadelphia at the American Stomach Hospital, Philadelphia. The malignant pylorus was then stitched to the abdominal wall, after which five radium needles attached to braided silk thread were inserted extraperitoneally into the growth parallel to the serous membrane, and allowed to remain in place for twenty-four hours. After withdrawing the needles the abdominal incision was closed by through and through sutures, which had been inserted without tying at the time of the operation. The wound in both cases healed by first intention and the patient made rapid recovery. One patient gained much in weight, suffers no discomfort, and is now in good health after one year. The other case died nine months after the treatment, perhaps from recurrence of the disease, but the temporary improvement in health and relief from pain were remarkable. This may have been due perhaps in a measure to the gastroenterostomy.

After experimentation with various metallic elements, including gold-plated steel, platinum, iridoplatinum, monel metal, stellite, and an alloy of steel and nickel known as "non-corrosive steel," the last named has been adopted as most durabe and possessing the proper filtration qualities for the purpose of radium application. These needles have been made to order in lengths varying from 20 to 30 milimeters. Some are round with tapering points, others have cutting, trocar points; and yet others are compressed until they are slightly flattened though still

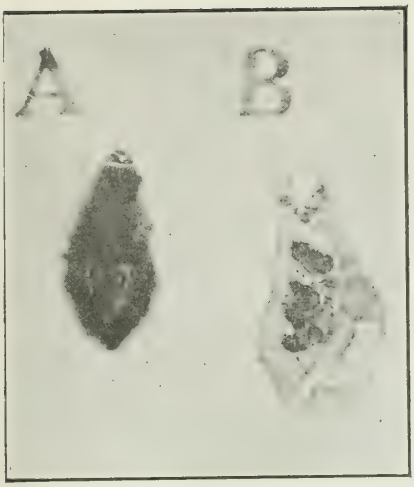

Fig. 20.—A, showing sequestrum of exostosis of the hard palate following devitalization of bone by the desiccation method. There is less danger of entering the antrum by this method, with careful technic, than if the chisel or other bone instruments were used alone. B, sequestrum of alveolus following electrocoagulation treatment of carcinoma.

maintaining the hollow center, so that they may be inserted, for example, through an endoscope into the larynx between the cartilage and the membrane with a minimum amount of trauma to the tissues. The eye end of the needle is tapering so that it may be withdrawn easily by means of a braided silk thread after insertion below the surface. The shorter 20 mm. needles are used in delicate structures such as the eyelids, canthi, larynx, etc., and the longer 30 mm. needles in less delicate structures more extensively diseased. The wall thickness is invariably 0.3 mm., as this seems to give the desired filtration. The diameter at the widest point of the author's needles is 2 mm. or 15 gauge measured by a Stubs English wire gauge. The hollow needles are so constructed that they are divided about 1 mm. below the eye. After the needles are filled with radium sulphate in the laboratory, the sections are screwed together, welded securely, and polished, so that there will be no leakage of radium emanation and no possible focus of corrosion with resultant loss of radium. If the needle wears through at the eye, the upper section may be replaced without discarding the whole needle or jeopardizing the radium.

These radium needles may be inserted directly into soft tissue by means of a special applicator or a small pointed hemostat, and they may be carried beneath the surface of the growth as deeply as desired. A braided silk thread is always attached to the needle so that it may be withdrawn easily from the tissue, and to obviate the possibility of losing the needle with the subsequent necessity of incising to find it. In dense, hard tissue a trocar or narrow blade scalpel is first used to render the insertion of the needle possible without force. Local anesthesia by 2 per cent. novocaine and adrenalin is ordinarily used, although when many needles are inserted at one time in very sensitive structures a general anesthetic may be employed to advantage.

Proper filtration is all important with any radium treatment, depending upon whether the beta or gamma rays are to be utilized. The hardest of the gamma rays are very penetrating and exert a more powerful action upon malignant cells than the others, though the softer gamma and beta rays are utilized especially where destruction of tissue is desired. It is impossible to discuss in one paper the important filtration question, the uses of the different radium rays, modifications of technic and indications for combined methods to suit various types of cases. Essential information along this line may be obtained from textbooks and current medical literature dealing with radium therapy. A book* by the author now in preparation will be devoted to this subject.

*"Electricity, Radium, X-Rays, and Ultraviolet Rays in the Treatment of Surgical Conditions," by William L. Clark, M.D. F. A. Davis Company, Philadelphia, Publishers.

It is still the opinion of some physicists and radiumologists that radium needles are of little practical utility, since it is thought that the secondary radiations from the metal in contact with the tissues cause great irritation and objectionable sloughs even with short exposures, and that sloughing near vital structures may jeopardize the life of the patient. Clinical experience has demonstrated the fallacy of this idea, if exposure is not too long. It is true that, when a metal applicator containing radium is applied to the dry skin for a sufficient period of time. a severe burn of the third degree and sloughing of tissue will result; but when radium needles, each containing 5 to 10 milligrams, or even more, of radium element, are inserted into moist tissues such as constitute malignant growths, the film of moisture surrounding the needles may perhaps be sufficient to absorb the secondary rays and the destructive beta rays. The needles may remain in place in some tissues as long as 24 hours, causing retrogression and disappearance of malignant growths but no destruction by sloughing. Tissues of low vitality, or tructures such as the uvula, or soft tissues which are partly broken down or devitalized will slough unless the radium dosage is accurately estimated; hence the time of exposure must depend upon the density and vitality of the tissues and the proximity to vital structures, although blood vessels such as the carotid artery are surprisingly resistant and no damage has ever been noted, even though the needles were close to the artery as long as 24 hours. In some cases of very advanced cancer of the cervix the needles have been allowed to remain in place 48 hours without great sloughing and with excellent results. Radium needles are applicable in cases of malignancy where tissue is to be conserved for vital or cosmetic reasons, and their great value has been proved in many cases.

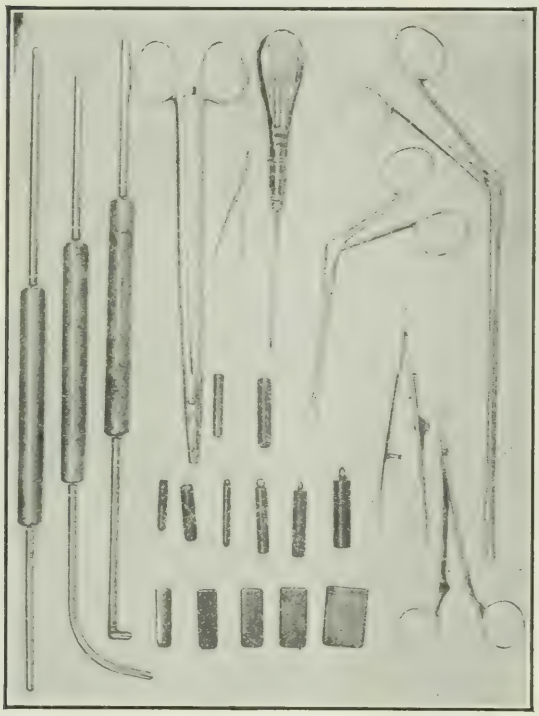

Fig. 21.—Applicators, trocar, forceps, containers, etc. The needles may be used singly, grouped together in round brass capsoles, or placed side by side in flat brass containers as shown.

Radium needle treatment should be administered in a hospital under strictly sterile conditions with a trained nurse in attendance. Every case is a rule unto itself and no absolutely definite guide can be given as to the duration of the application or the amount of radium to be used. Generally speaking, the needles placed in sarcomatous tissue 20 millimeters apart should be withdrawn in 12 hours. In the case of carcinoma the needles placed 25 millimeters apart should be withdrawn in

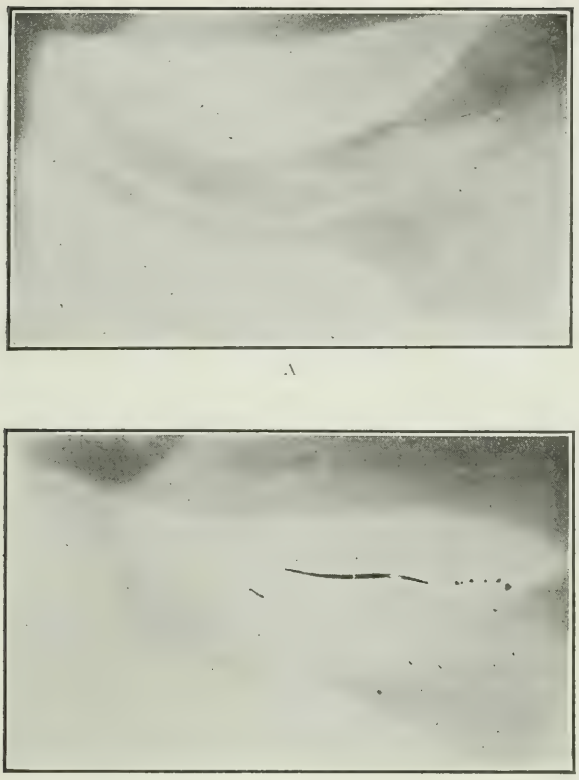

Fig. 22.—A, showing sequestrum of lower jaw after electrocoagulation treatment of extensive carcinoma of the alveolus with the view of conserving a shell of bone in the inferior position, thus avoiding the necessity of complete resection. B, showing fracture of the jaw after sequestrum was removed. This united quickly and deformity was avoided.

from 18 to 24 hours. The treatment is repeated in six weeks, if necessary, although one needle treatment is usually all that is required. The subsequent treatments may be given by capsule from the outside.

It is felt that radium in needles has been employed for too brief a period to attempt analytical and statistical study of results in regard to permanency, hence this paper may be regarded more as a preliminary report than as a final analysis. Encouraging results have been accomplished during the past two years since radium needles have been shown to be of practical utility in the treatment of malignant lesions, even with almost no guide as to filtration, time of exposure to the rays, and technic generally; yet it is the author's conviction that this method of treatment is only in its infancy and that the future will show radium, with better technic and greater knowledge concerning it, to be of far greater potency than is realized at the present time. It is not to be understood that all cases of malignant disease uniformly react favorably to radium, for it has been observed that some cases respond better than others. The impression from present experience is that, if a malignant lesion does not respond to three or at most four full radium treatments, then the

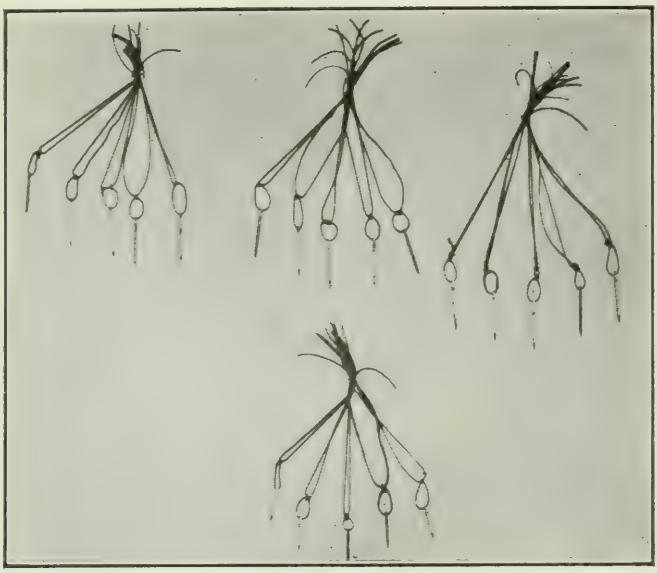

Fig. 23.—Radium needles. The tnree sets of needles above are 25 millimeters long, contain 10 milligrams of radium each, and are attached to braided silk thread. The single set below are 20 millimeters long and contain five milligrams of radium.

lesion cannot be favorably influenced by further treatments. One must guard against overexposing patients to radium. If a malignant lesion is overexposed, great devitalization and sloughing of the normal tissue beyond the malignant growth is likely to result. The ulcer shows little tendency to heal, and this condition may be so serious as to be almost as undesirable as the malignant lesion itself. Beginners in the use of radium are therefore warned to underexpose patients rather than overexpose them to the powerful radium rays, until an exact technic of application has been acquired. It seems appropriate at this time to sound a note of warning to physicians and attendants to guard themselves against handling radium carelessly. Familiarity breeds contempt and it is advised that eternal vigilance be practiced, else distressing permanent, third degree burns, keratoses, and even cancer of the exposd parts may rsult from the constant irritation of radium rays. Distance is the best safeguard and it should be the invariable practice to handle radium applicators of any description with forceps at least four to six inches in length.

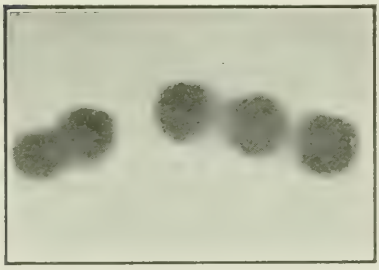

Fig. 24.—Five needles, each containing 10 mg. of radium, were placed upon an envelope containing a sensitized photographic plate for two minutes. Note concentric radiations from needle to needle. Radium rays are projected in the tissues in the same manner.

Notwithstanding the potency of radium, it is better not to temporize unnecessarily with cancer. If the lesion is localized and can be conveniently immediately and entirely destroyed by some method, such as electrodesiccation or coagulation, it is recommended that it be employed in preference to radium or operative surgery as the primary agent; provided there is a chance of eliminating the disease at *one* operation; otherwise the growth

will be stimulated. The author's personal preference is electrodesiccation or coagulation, since the destructive action may be accurately confined and the blood and lymph channels sealed, rendering local recurrence less likely. This may be followed by radium applied to the site of the operation as an additional safeguard, if this appears necessary.

Operative surgery is of the greatest importance in cancer involving inaccessible anatomical structures to ligate blood vessels, if necessary, and when there is extensive bone involvement; but the use of electrothermic methods, radium, r-rays, or perhaps all in combination, directly applied immediately after operation, will reach malignant cells inaccessible to the scalpel with results that cannot possibly be obtained by surgery alone. It is therefore concluded in the light of experience that the greatest success in the treatment of malignant disease in its various manifestations lies in the complimentary action of surgery, electrothermic methods, radium and x-rays, judiciously selected or combined to meet the particular requirements of the individual case.

REVIEWS AND ABSTRACTS

Everett S. Lain, M.D. (Oklahoma City). A Clinical Study of Epithelioma of the Lower Lip. Jour. A. M. A. lxxv, 1052-1055, Oct. 16, 1920.

"During the last few months I have been impressed by the increasing number of cases of epithelioma of the lower lip which I have had occasion to see. After observing a few metastases in unusual regions, I was led to make a partial review of medical literature for reports on malignancy in this particular region of the body, and to correlate and summarize my own private cases which have occurred during the last ten years. In reviewing some of the literature, I was rather disappointed to find that although cancer of the lower lip constitutes more than 2 per cent. of all deaths from cancer, American physicians have not in their writings dealt very frequently with this subject."

"In the private practice of Dr. M. M. Roland, my associate, and myself during the last ten years we have seen 122 cases in which the diagnosis of epithelioma of the lower lip was made."

"For purposes of prognosis and routine treatment we have found it convenient to classify epithelioma of the lower lip in three groups."

"Class 1. Epitheliomas which may begin as a seborrheic-like crust, a small recurrent vesicle or fissure, at first superficial, later becoming infiltrated and indurated, etc., and situated entirely or almost entirely on the cutaneous surface of the lower lip. These lesions are generally of slow growth and late to metastasize. If metastasis does eventually take place, it is usually in the smaller and more superficial of the submental, supracricoid or anterior submaxillary glands, which are easily palpable and freely accessible to treatment by any method."

"Class 2. Those which are so located that one-third or more of the lesion overlaps the mucocutaneous border of the lip, though no glandular enlargement is easily palpated. However, if a more careful examination is made in each of these cases, perhaps after only a few weeks' duration, there probably can be felt, in the suprathyroid of the deep submaxillary regions, glandular enlargement due to an already begin-

ning infiltration with malignant or other inflammatory products. These are the cases which have in the past so frequently deceived both the surgeon and radiotherapist by the rapid metastatic development within a few weeks or months after the primary growth had apparently been successfully treated or removed. We are convincel that routine attention to the lymph drainage of this class of epitheliomas, however early or localized they may at first appear, whether the treatment be surgery or radiotherapy, will result in quite a perceptible increase in the percentage of cures."

"Class 3. All cases in which more than half of the malignant growth is situated on the mucous surface of the lip of many weeks' or months' duration, and cases which owing to neglect or incomplete treatment, have had a marked recurrence. In this class of cases there has frequently already begun in the submental, submaxillary and perhaps the upper group of the deep cervical glands, metastases which are extremely difficult to discover and remove. In this class of cases the prognosis by any known method of treatment is always unfavorable."

"In our series of 122 consecutive cases of epithelioma of the lower lip, 117 were men and 5 were women, the ages ranging from 23 to 86 years, affecting mostly farmers and outdoor laborers. Treatment with the roentgen ray or radium, singly or combined, was given to 107 patients. Of seventy-two patients treated and belonging in Class 1, 95.8 per cent. are living today or have lived for more than three years. Of twenty-seven patients belonging in Class 2, 70.3 per cent. lived from one to nine years. In Class 3, nineteen patients were examined, of whom four were treated. Three of these died within one year."

"Treatment. All agree that radical removal of all possible pathologic cells is the single aim of any successful method of treatment, and that complete surgical extirpation of the primary growth, with careful dissection of all metastasizing glands has cured a high percentage of cases of epithelioma of the lower lip. However, no well informed, unbiased physician longer doubts that just as successful work with either roentgen ray or radium, or with their combined application, may be accomplished in a certain class of cases in the hands of expert radiotherapists."

"When we consider the complete function of the lymph glands, is it not reasonable to suggest that a certain degree of stimulation instead of extirpation is the more scientific method of eliminating or preventing metastases in a certain class of epitheliomas, as well as in ordinary inflammatory products which they collect?"

"Conclusions. 1. Considering the gravity of epithelioma of the lower lip and its frequency in adult males, we believe the subject has not been given the study and attention it deserves by American physicians."

"2. As noted by others, our reports also show epithelioma of the lower lip to be far more common in outdoor workers, and most frequently seen on the side of the mouth where a cigar or pipe is held.

"3. Early diagnosis and treatment of the lymph drainage of the lips will materially raise the percentage of cures."

"4. Neither surgery, radiotherapy nor any other one successful method of treatment should be used in all cases alike."

"5. Radium and the roentgen ray, singly or combined, give the most satisfactory results in a selected class of epithelioma of the lower lip."

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